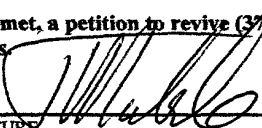


FORM PTO-1390 (REV. 11-2000)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEY'S DOCKET NUMBER 115.9
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371			U.S. APPLICATION NO. (if known, see 37 CFR 1.5) 09/807968
INTERNATIONAL APPLICATION NO. PCT/CA99/01000	INTERNATIONAL FILING DATE October 29, 1999	PRIORITY DATE CLAIMED October 29, 1998	
TITLE OF INVENTION Drive Shaft Coupling Device			
APPLICANT(S) FOR DO/EO/US Nowal Pierson and Zan Gullickson			
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:			
1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. 4. <input checked="" type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). a. <input type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). Items 11 to 20 below concern document(s) or information included: 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input type="checkbox"/> A FIRST preliminary amendment. 14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 15. <input type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A change of power of attorney and/or address letter. 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 20. <input type="checkbox"/> Other items or information:			

U.S. APPLICATION NO. 09/807968		INTERNATIONAL APPLICATION NO. PCT/CA99/01000		ATTORNEY'S DOCKET NUMBER 115.9	
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1000.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$860.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$690.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	19 - 20 =	0	x \$18.00	\$ 0	
Independent claims	3 - 3 =	0	x \$80.00	\$ 0	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$270.00	\$ 270.00	
TOTAL OF ABOVE CALCULATIONS =				\$ 1130.00	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$ - 565.00	
SUBTOTAL =				\$ 565.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$	
TOTAL FEES ENCLOSED =				\$ 565.00	
				Amount to be refunded:	\$
				charged:	\$
a. <input type="checkbox"/> A check in the amount of \$ _____ to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. _____. A duplicate copy of this sheet is enclosed. d. <input checked="" type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="width: 60%;"> Thomas E. Malyszko Patent & Trade Mark Agent Suite 1500, 250 - 6 Ave. S.W. Calgary, Alberta, Canada T2P 3H7 </div> <div style="width: 35%; border-left: 1px solid black; padding-left: 10px;"> SIGNATURE  Thomas E. Malyszko NAME 39,466 REGISTRATION NUMBER </div> </div>					



TITLE: DRIVE SHAFT COUPLING DEVICEFIELD OF THE INVENTION

5 The present invention relates to an improved drive shaft coupling device,
including an improved shear bolt arrangement for the coupling device.

BACKGROUND OF THE INVENTION

10 Overload protection devices, as may be installed on rotating drive shafts,
must be able to withstand various loads and conditions. It is important that the
overload devices connect both ends or members of the drive shaft in such a manner
that there is no relative movement between the drive shaft ends, either axial or radial.
Upon encountering an overload condition and the consequent rupturing of the
shearing connectors, the overload devices should allow the two drive shaft ends to
rotate relative to each other consistently at pre-determined torque loads. Previous
15 designs have not been able to attain consistency of shearing while maintaining
absolute relative proximity (i.e. position or spacing) of the two ends of the drive shaft
coupling device. In previous designs, the fact that the relative proximity of the ends
of the drive shaft coupling device must be maintained has meant that inconsistent
friction between the two ends of the coupling device has resulted in inconsistent
20 shearing of the shear pins or bolts.

Inconsistencies in the friction between the two ends of drive shaft coupling
devices have several causes, such as improper torque settings of the shear bolts,
inconsistent surface finishes of the mating or contacting surfaces of the drive shaft
coupling device, or corrosion between the contacting surfaces of the coupling device.
25 Although in theory these inconsistencies might be overcome with conventional shear
bolts or pins, in reality it is difficult and impractical.

The novel shear bolt of the present invention, designed in conjunction with novel flanges of the drive shaft coupling device, provide a relative positioning or spacing of the two ends of the drive shaft coupling device, yet allow a consistently controllable shearing of the device in overload conditions. The spacing of the two ends of the drive shaft coupling device is maintained both before and after overload. The designed or desired shear torque of the new drive shaft coupling device is not affected by inconsistencies in the torque settings of the shear bolt nuts, inconsistencies of surface finish in the opposing ends of the drive shaft coupling device, nor by corrosion of the mating or contacting surfaces of the device. With the novel design of the present invention, a desired result is attained consistently and economically.

SUMMARY OF THE INVENTION

The invention provides a device to connect the opposed flanges of a drive shaft coupler in a manner so as to maintain the relative position or spacing of the opposed flanges, and yet allows for consistent and controllable shearing of the connecting shear bolts upon the drive shaft coupler encountering an overload condition.

The present device has a first drive shaft coupler flange and a second drive shaft coupler flange rotatable about a common axis. Each flange has at least two shear bolt retaining slots which may be axially aligned with corresponding shear bolt retaining slots on the other opposing flange.

The device has at least two shearable connectors or bolts, each one threaded from both ends with a shoulder at the end of the threads. Between the two shoulders there is a shear point or area that is turned down on a lathe in order to be of a closely controlled diameter and to be of a lesser shear strength than the rest of the shear bolt. The connectors are to be arranged for balanced common rotation of the first and

second drive shaft coupler flanges, and when the connectors shear or rupture upon overload condition of the drive shaft coupler.

5 The shoulders of shearable connectors provide a means of controlling the distance between the two opposing flanges of the drive shaft coupler as well as providing a surface with which to oppose the tension applied to the shearable connector when tightening the nut on the threads of the connector in order to rigidly affix the connector to the drive shaft coupler flange.

10 The shearable connectors also have opposing flat surfaces located between the end of the threads and the shoulders of the connector, which flat surfaces fit closely inside the shearable connector retaining slots of the drive shaft connector in order to prevent the shearable connector from rotating when installing or removing the nuts from the ends of the connectors.

15 The drive shaft coupler flanges also have a circular recessed area on the exposed side of the flange where the nut of the shearable connector contacts the flange. The circular recessed area is of a size to fit a standard flat washer which is in turn the appropriate size to fit the connector. A purpose of the recessed area is to locate the connector at the desired distance from the axial center of the drive shaft coupler.

20 The device also has a means to seal contaminants and corrosive elements out of the area of the drive shaft coupler where metal parts are in close proximity to each other, and a means to periodically introduce lubrication into the sealed area.

DESCRIPTION OF THE DRAWINGS

25 Fig.1 is an exploded cross-sectional view along line 1-1 of fig.4 of a preferred embodiment of the coupling device of the present invention, and also shows two end sections of a drive shaft;

Fig.2 is a close-up view of a shearable connector of the present invention;

Fig.2a is a cross-sectional view along line 2a-2a of fig.2;

Fig.2b is a cross-sectional view along line 2b-2b of fig.2;

Fig.2c is a cross-sectional view along line 2c-2c of fig.2;

Fig.2d is an end view of the shearable connector of fig.2;

5 Fig.2e is a top view, in the direction of arrow E, of the shearable connector of fig.2;

Fig.3 is a sectional view of the coupling device as in fig.1 showing the device assembled and connected to the drive shaft end sections;

Fig.4 is an end view of the coupling device of fig.3 with two shearable
10 connectors removed; and,

Fig.4a is a cross-sectional view along line 4a-4a of fig.4.

DESCRIPTION OF PREFERRED EMBODIMENTS

The figures shows various views of a drive shaft coupling device, generally
15 indicated by the reference number 10, for connecting two ends of a hollow drive shaft 12 which is rotatable about a longitudinal axis 14. The drive shaft coupling device 10 may be factory installed during assembly of the device or vehicle in which it is to be used, or it may be retro-fitted at a later date. Either way, the drive shaft 12 will have first and second sections 16 and 18, respectively, both aligned about the
20 axis 14. For ease of reference, the first and second sections 16, 18 may also be referred to as the right and left sections 16, 18, as viewed in fig.1. In its preferred embodiment, the device may be installed and used on any machine requiring the use of a rotating drive shaft where there is a chance of encountering an overload condition and where there could also be a need for the drive shaft to rotate at high
25 speeds, such as up to 2500 RPM or higher.

The coupling device 10 has first and second coupling members, or couplers, indicated by the reference numbers 20 and 22, respectively. For ease of reference,

the first and second coupling members 20, 22, may also be referred to as the right and left coupling members 20, 22, as viewed in fig.1. The right coupling member 20 is connected to the right drive shaft section 16 and the left coupling member 22 is connected to the left drive shaft section 18. The method of connecting the coupling members 20 and 22 to the drive shaft sections 16 and 18 is normally by welding, but other methods may be used. The right coupling member 20 has a hollow projecting sleeve 32 which is insertable into the end of the right drive shaft section 16 in what is normally a light interference fit. The right drive shaft section 16 abuts the radial inclined area 34 of the coupling member 20. The radial inclined area 34 provides both a firm abutment for the drive shaft 16 as well as providing an suitable area in which to weld together the coupling member 20 and the drive shaft 16. It will be obvious to those skilled in the art that the right drive shaft section 16 may be manufactured integrally with the coupler 20 so as to eliminate the weld in the area of the radial inclined section 34.

In a similar fashion as for the right coupling member 20, the left coupling member 22 has a hollow projecting sleeve 26 which is insertable into the end of the left drive shaft 18 in what is normally a light interference fit. The drive shaft section 18 abuts the radial inclined area 28 of the coupling member 22. The radial inclined area 28 provides both a firm abutment for the drive shaft 18 as well as providing an suitable area in which to weld together the coupling member 22 and the drive shaft 18. It will be obvious to those skilled in the art that the shaft section 18 may be manufactured integrally with the coupler 22 so as to eliminate the weld in the area of the radial inclined section 28.

The right coupling member 20 has another projecting and hollow sleeve 36 opposite the projecting sleeve 32. In the preferred embodiment, the sleeve 36 is hollow in order to reduce rotating weight, although it may be made thicker of solid if desired. The projecting sleeve 36 is axially aligned about the axis 14 in order to fit

within a hollow bore 38 of the left coupling member 22 in a close clearance fit. Such fit should be of an appropriate clearance in order to facilitate smooth rotation between the coupler members 20 and 22. The length of the bore 38 in relation to the projecting sleeve 36 is such that the sleeve 36 extends past the bore 38 a suitable distance to weld or otherwise affix thereon a retaining sleeve 40 which prevents the two coupler sections 20 and 22 from separating upon rupture of the shear bolts 50.

The right and left coupling members 20 and 22 have first and second radially extending flanges 42 and 44, respectively. Each flange 42, 44 has at least two radially extending open-ended slots 46 and 48, respectively, and in the preferred embodiment shown three circumferentially spaced slots 46, 48 are provided, as best seen in fig.4. Each slot 46 in the first flange 42 is positioned so that it is directly adjacent to a corresponding slot 48 on the second flange 44.

An important aspect of the invention are the shear bolts 50. Each shear bolt 50 fits through the respective slots 46 and 48 of both flanges 42 and 44 concurrently, with the shoulders 52 of the bolt 50 contacting the inside of the flanges 42 and 44. Referring in particular to figures 2 to 2e, each bolt 50 has two opposed flat sides 54 which are a suitable distance apart to form a close clearance fit inside the slots 46 and 48 to allow easy installation and/or replacement and to prevent the shear bolt 50 from rotating within its slot when threaded hex nuts 56 are installed. When the shear bolts 50 are inserted into the radial slots 46 and 48 on the flanges 42 and 44, flat washers 58 and lock nuts 56 (or other suitable fasteners) are assembled onto both ends of the shear bolts 50 (see figs. 1, 3 & 4a). The nuts 56 are tightened to draw the flanges 42 and 44 together until the shoulders 52 of the shear bolts 50 are in close contact with the inside of the coupler flanges 42 and 44. In doing so, the flanges 42 and 44 are held at a set distance "X" from each other and are securely connected to one another. The shear bolt 50 also has a shear area 60 or zone between the shoulders 52. This shear zone 60 is turned down on a lathe or other machine tool in

such a way as to provide a shear area that is both much more susceptible to shearing or rupture than the rest of the shear bolt 50 or any other part of the entire coupling device 10 or drive train, and is of a pre-set and controllable diameter to achieve a desired ultimate shear torque of the entire coupling device 10. Hence, one can accurately control the maximum torque at which the bolts 50, and hence the coupling device 10, will shear to break the rotatable connection or link between the drive shaft sections 16, 18 so as to avoid damage to the drive shaft from an over-torque situation. The bolts are therefore the equivalent of fuses in an electrical device.

Both flanges 42 and 44 have on their outside faces circular recesses 62 and 64 (see figs.1 & 4) centered radially on the slots 46 and 48. The recesses are of a depth approximately equal to or slightly greater than the thickness of the flat washers 58, and are a predetermined distance from the central axis 14 of the coupler 10. These recesses 62, 64 are sized in their diameter to allow the flat washers 58 to fit inside, therefore positioning the shear bolt 50 a set radial distance from the axis 14. The washer's central aperture or opening 59 (indicated in fig.1) also influences the bolt's radial distance from the axis 14. Should a slightly lesser or greater radial spacing from the axis 14 be required for the shear bolt, the location of the aperture 59 in the washer may be suitably altered without changing the design or dimensions of the recesses 62, 64 or any other part of the couplers 20, 22. The recesses 62, 64 also prevent the shear bolts 50 from being thrown outwardly by centrifugal force, particularly should the lock nuts 56 become loosened.

Coupling member 20 also has a radial protrusion 66 (see figs.1 & 3) which in turn has a radial slot 68 for the purpose of keeping or housing a resilient O-ring 70 or other lubricant retaining device. When the flanges 42 and 44 are drawn together as mentioned above, and they are at a set distance from each other, the O-ring 70 forms a seal with the inside of flange 44. The left coupling member 22 also has an internal passageway 72 for introducing grease or other lubricant into the area formed by the

clearance fit between the sleeves 36 and 26. The passageway 72 may also have a device to more easily facilitate the introduction of lubricants and to keep dirt out, such as grease nipple 74.

5 The above description is intended in an illustrative rather than a restrictive sense, and variations to the specific configurations described may be apparent to skilled persons in adapting the present invention to other specific applications. Such variations are intended to form part of the present invention insofar as they are within the spirit and scope of the claims below. For example, the shear bolt 50 may be used to connect many other types of coupling members, whether mechanical or structural
10 types, and rotatable or non-rotatable, which should be designed to shear or otherwise break at a given force. One such use is with highway posts or signs which must give or detach from their support bases, pedestals or legs at given impact forces to reduce or avoid the risk of injury to highway users.

WE CLAIM:

1. A shearable connector for joining two coupling members and transferring a desired torque therebetween, said shearable connector comprising an elongate bolt element having:

5 a middle portion forming a shearable sector of a given shear strength;

a shoulder element on either side of said middle portion for abutting a respective coupling member to provide a pre-set clearance between at least a portion of said coupling members when joined; and,

10 an end portion extending from each of said shoulder elements and having a threaded part for receiving a nut member thereon for clamping said bolt element to said coupling members.

2. The connector of claim 1 wherein said end portion includes an intermediate portion between said shoulder element and said threaded part adapted to slideably engage said coupling member in a desired orientation.

3. The connector of claim 2 wherein said intermediate portion includes opposed planar portions to prevent rotation of said bolt element during installation and removal of said nut member.

4. The connector of claims 1, 2 or 3 further including a washer element having an aperture therein for insertion onto said end portion between said nut member and said coupling member, wherein the location of said aperture in said washer element may be changed to alter the radial spacing of said bolt element from the radial centre of said coupling members.

5. The connector of claim 4 wherein said shoulder element has a greater diameter than that of said middle and end portions for sandwiching said coupling member between said shoulder element and said washer element.

5 6. A shear bolt for joining coupling members comprising:

an elongate core element having a first portion forming a shear area of a given shear strength, a second portion on each side of said first portion forming a shoulder of larger diameter than said first portion and adapted to provide a pre-set spacing between opposed coupling members at least in the vicinity of said shear bolt, and a third portion extending from each of said shoulders adapted to receive a fastening member to secure said core element with said coupling members.

10

7. The shear bolt of claim 6 wherein said third portion includes an shaped part adjacent said second portion for slideably engaging a coupling member transversely thereto.

15

8. The shear bolt of claim 7 wherein said shaped part includes opposed planar surfaces to avoid rotation of said core element during installation and removal of said fastening member.

20

9. The shear bolt of claims 6, 7 or 8 further including a washer element having an opening for insertion onto said third portion and adapted to register with a correspondingly shaped recess in a coupling member, wherein the location of said opening in said washer element provides a means of adjusting the spacing of said bolt element from a given radial reference point of said coupling members.

25

10. A shear bolt coupling assembly comprising:

a first coupling member with a first radially extending flange;

a second coupling member located coaxially with said first coupling member and having a second radially extending flange; and,

5 an elongate shear bolt having a first portion forming a shear area of a given shear strength, a second portion on each side of said first portion forming a shoulder of larger diameter than said first portion for abutting each of said first and second flanges to provide a desired clearance therebetween, and a third portion extending from each of said shoulders adapted to receive a fastening member to secure said
10 shear bolt with said first and second flanges, thereby securely connecting said first and second coupling members for transferring a shear force therebetween up to said given shear strength.

11. The assembly of claim 10 wherein said third portion includes a shaped part
15 adjacent said second portion for slideably engaging a respective first or second flange transversely to a longitudinal centreline of said first and second coupling members.

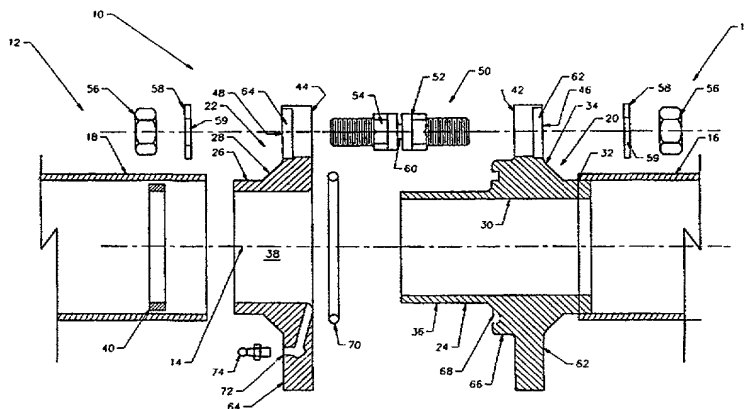
12. The assembly of claim 11 wherein said shaped part includes radially opposed
20 planar surfaces adapted to engage a respective first or second flange to avoid rotation of said shear bolt during installation and removal of said fastening member.

13. The assembly of claims 10, 11 or 12 further including a washer element
25 having an opening for insertion onto said third portion and adapted to register with a correspondingly shaped recess in a respective first or second flange, wherein the location of said opening in said washer element provides a means of adjusting the radial spacing of said shear bolt from a given radial reference point of said first and second coupling members.

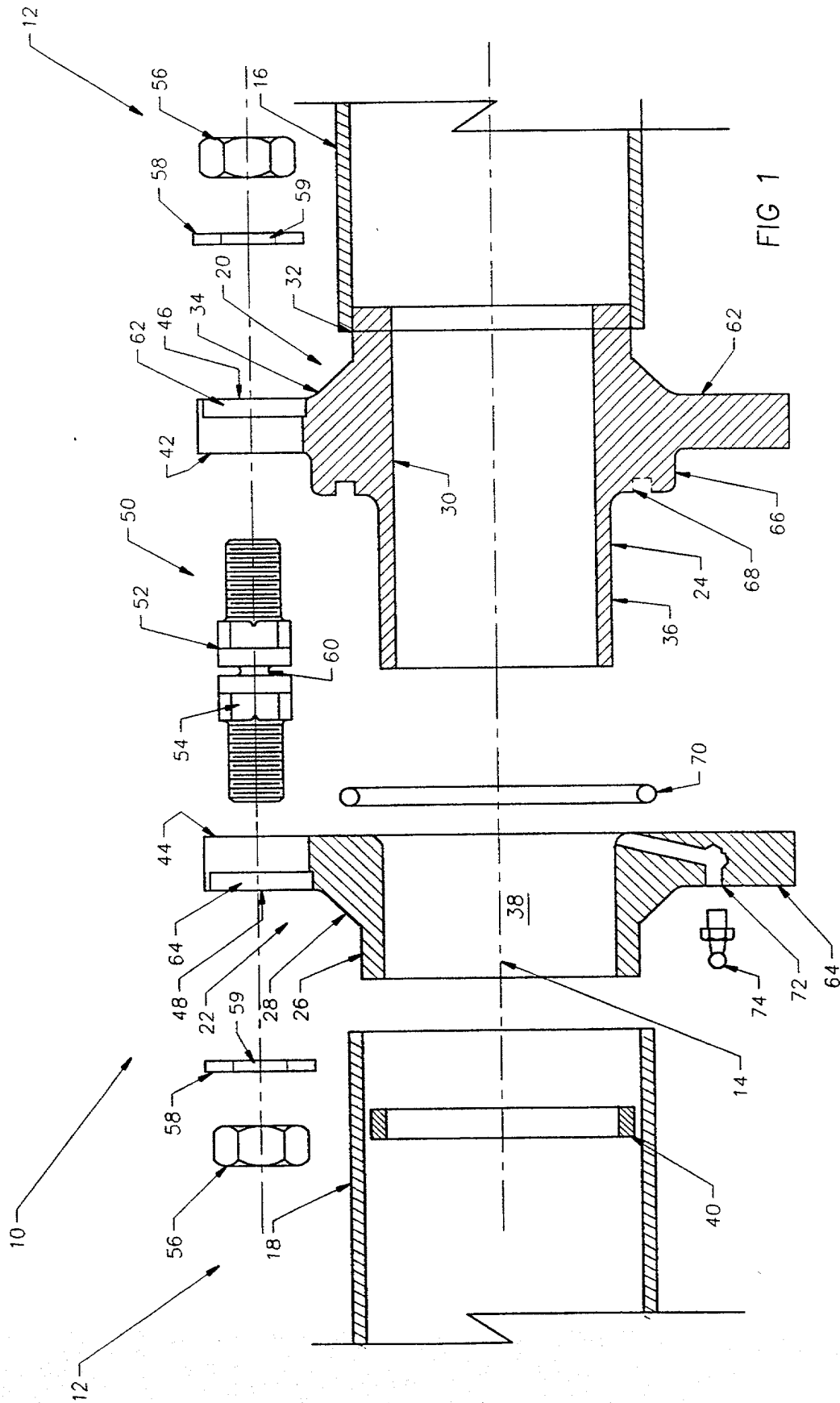


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : F16D 9/06, E01F 9/018	A1	(11) International Publication Number: WO 00/26554 (43) International Publication Date: 11 May 2000 (11.05.00)
(21) International Application Number: PCT/CA99/01000 (22) International Filing Date: 29 October 1999 (29.10.99) (30) Priority Data: 2,252,178 29 October 1998 (29.10.98) CA (71) Applicant (for all designated States except US): 648560 ALBERTA LTD. [CA/CA]; P.O. Box 165, Vauxhall, Alberta T0K 2K0 (CA). (72) Inventors; and (75) Inventors/Applicants (for US only): GULLICKSON, Zan [CA/CA]; P.O. Box 2175, Fort Macleod, Alberta T0L 0Z0 (CA). PIERSON, Nowal [CA/CA]; P.O. Box 29, Vauxhall, Alberta T0K 2K0 (CA). (74) Agent: MALYSZKO, Thomas, E.; Patent & Trade Mark Agent, #1500, 250-6 Avenue SW, Calgary, Alberta T2P 3H7 (CA).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW. Published <i>With international search report.</i>

(54) Title: DRIVE SHAFT COUPLING DEVICE**(57) Abstract**

An improved drive shaft connecting device, including a novel shear bolt (50) for connecting two ends or flanges (42, 44) of the drive shaft connecting device in a manner whereby the separate parts of the drive shaft connecting device are securely connected to each other and are yet free to disconnect from each other and rotate relative to each other in the case of an overload condition on the drive shaft or drive shaft connecting device. The shear bolt is double ended (i.e. threaded on both ends) and shouldered on both ends. The threads on each end allow the two flanges of the drive shaft coupling device to be pulled together to a pre-determined distance, which, together with a shear point (60), is set by the distance between the opposing shoulders (52) on either side of the shear bolt. As well, the flanges of the drive shaft coupling device are designed to accept the shear bolts in slotted openings (46, 48). The shear bolts are designed so that there is a flat area (54) on the shear bolt where it fits into the slots of the drive shaft coupling device, so that the resulting fit of the shear bolt into the drive shaft coupling device prevents the shear bolt from rotating within the slot of the drive shaft coupling device. By preventing the shear bolts from rotating, this fitting arrangement allows for easy installation and removal of threaded nuts on the shear bolt.



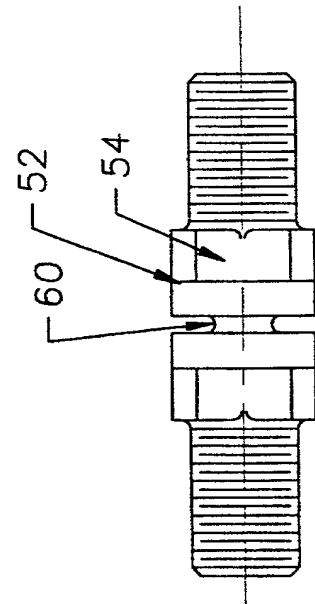
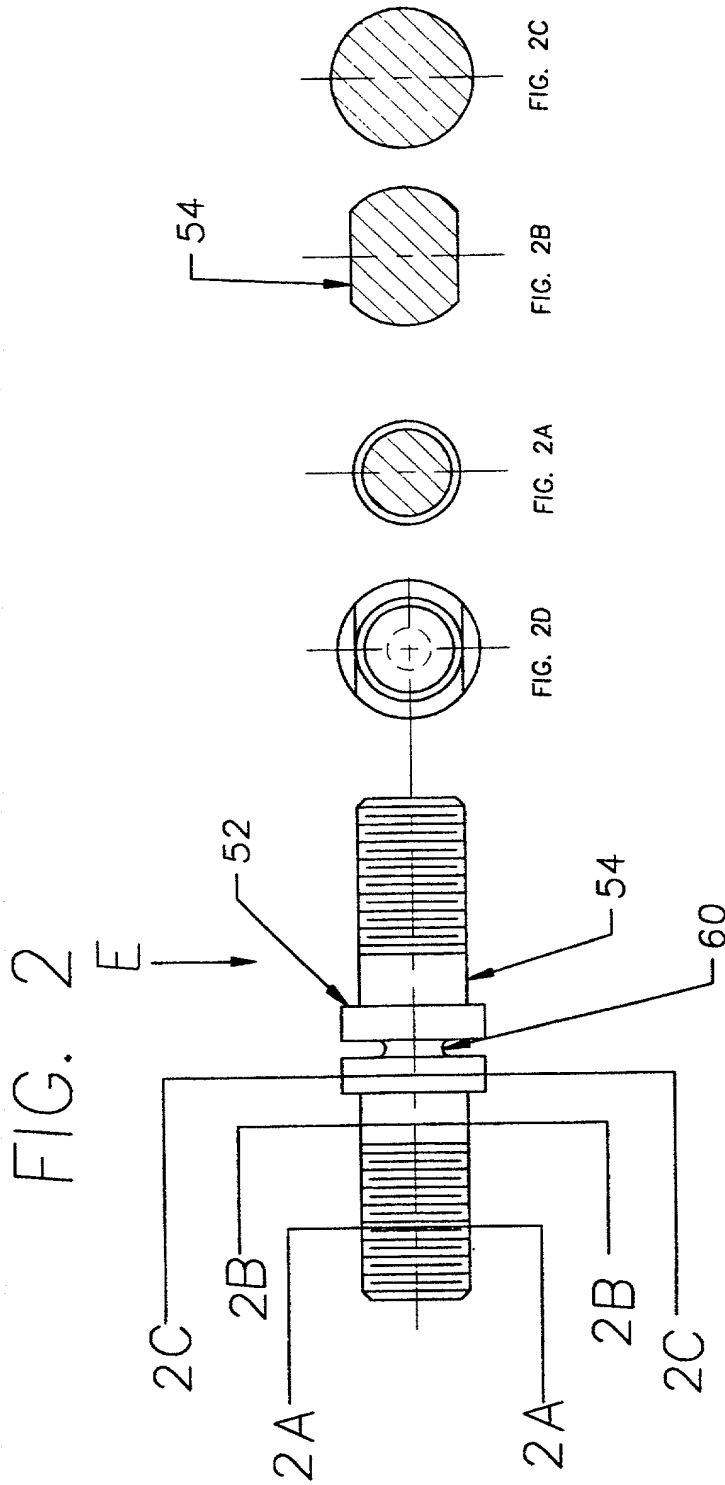
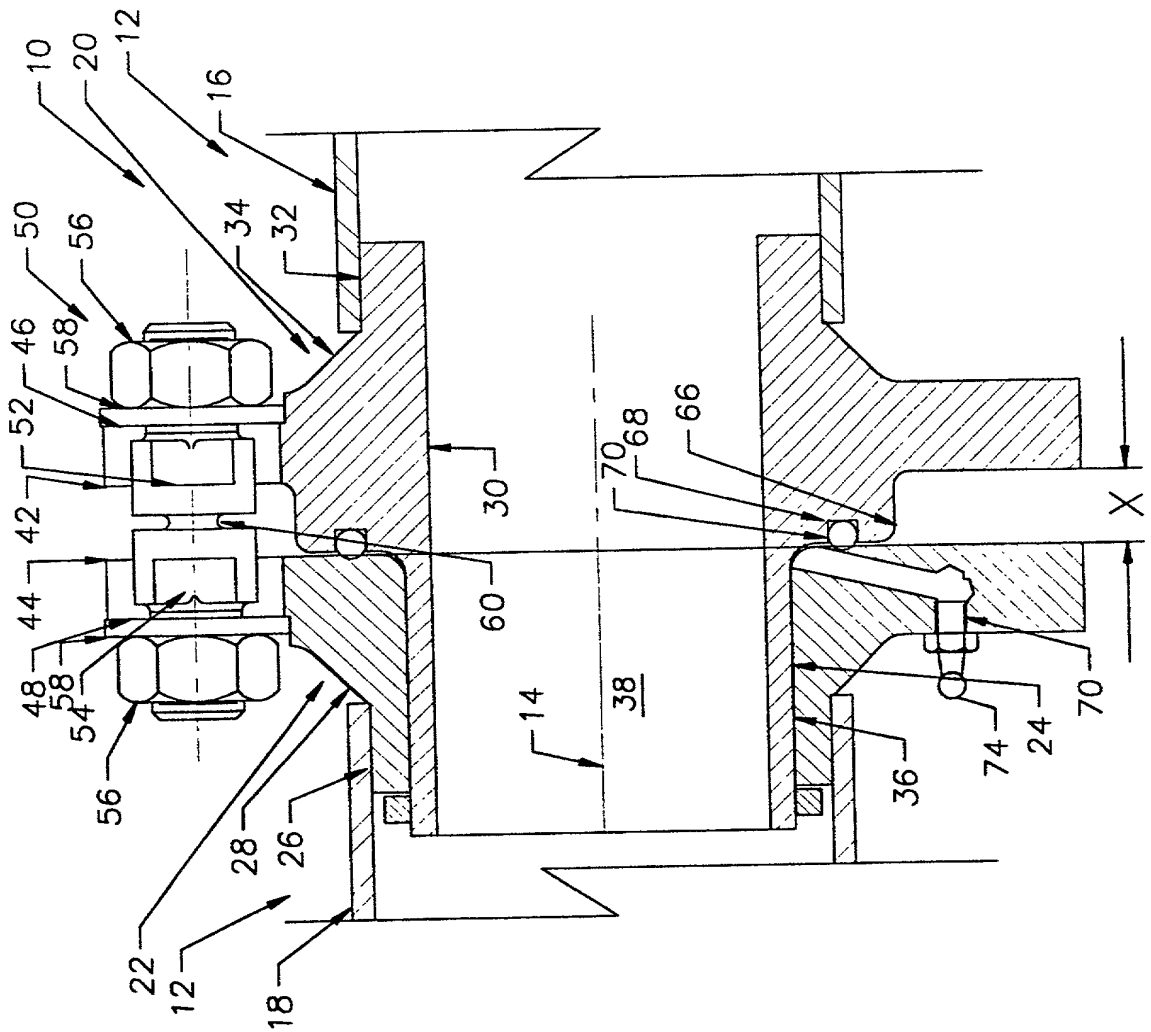


FIG. 2E

FIG. 3



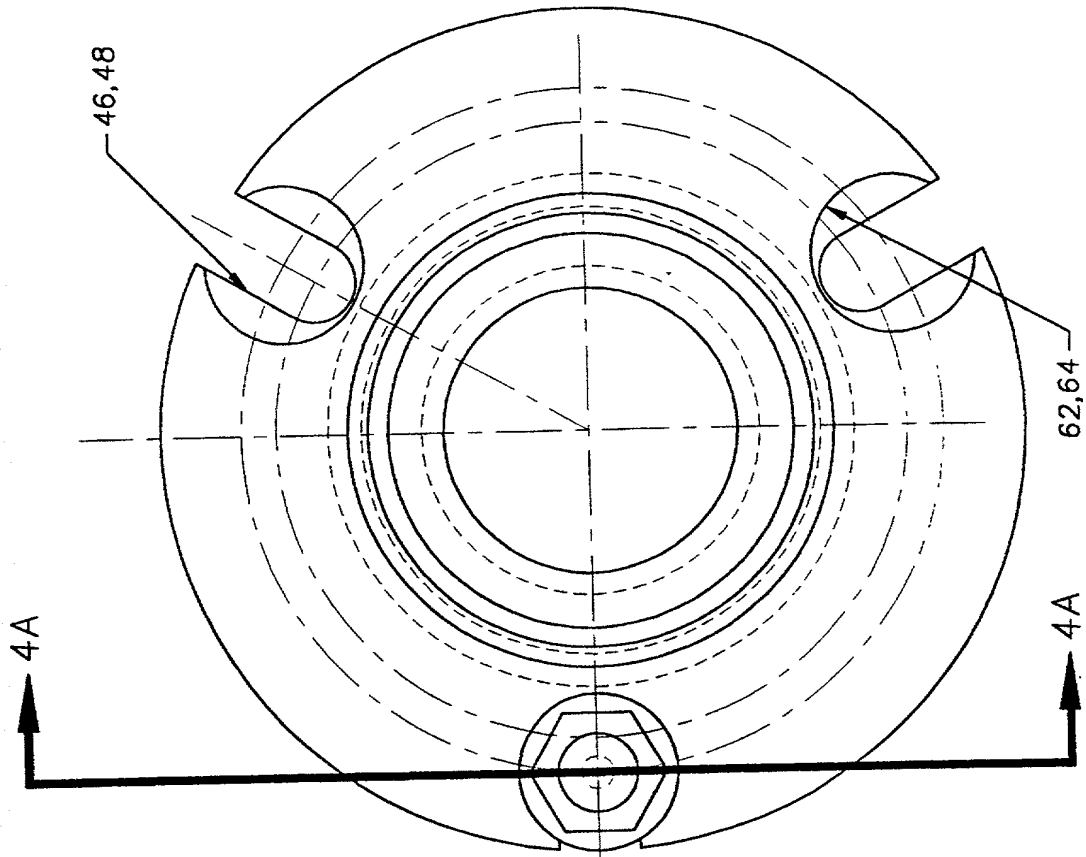


FIG. 4

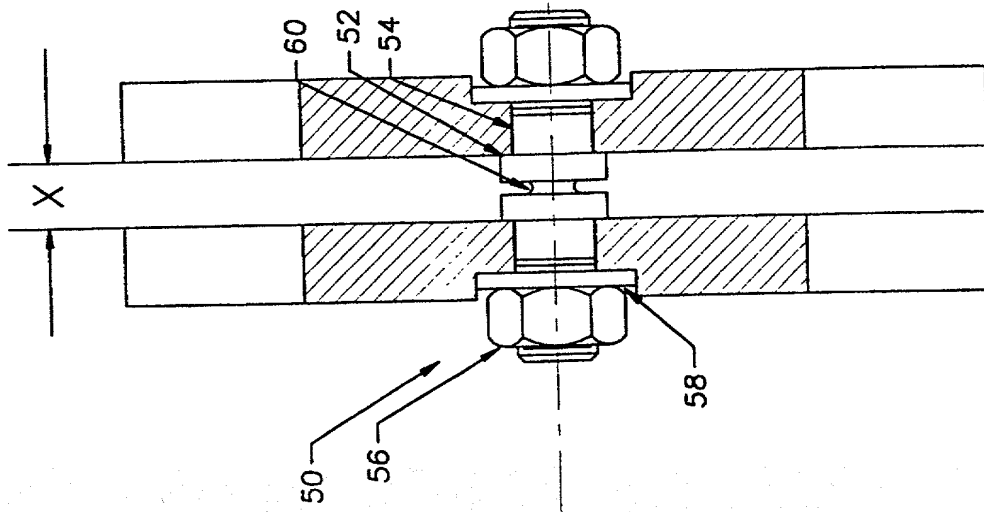


FIG. 4A

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

**DECLARATION FOR UTILITY OR
DESIGN
PATENT APPLICATION
(37 CFR 1.63)**

☐ Declaration Submitted with Initial Filing
OR
☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number 115.9

First Named Inventor Gullickson

COMPLETE IF KNOWN

Application Number 09 / 807,968

Filing Date (I.A.) 29 Oct 99

Group Art Unit

Examiner Name

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Drive Shaft Coupling Device

(Title of the Invention)

the specification of which

☐ is attached hereto

OR

☒ was filed on (MM/DD/YYYY) 10/29/1999 as United States Application Number or PCT International

Application Number PCT/CA99/1000 and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
2,252,178	Canada	10/29/1998	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

[Page 1 of 2]

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PTO/SB/01 (03-01)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.					
NAME OF SOLE OR FIRST INVENTOR:		<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle (if any)) <u>Zan</u>		Family Name or Surname <u>Gullickson</u>			
Inventor's Signature <u>[Signature]</u>		Date <u>JUNE 28/01</u>			
Residence: City <u>Fort Macleod</u>		State <u>AB</u>		Country <u>Canada</u> Citizenship <u>Canadian</u>	
Mailing Address <u>P.O. Box 2175</u>					
City <u>Fort Macleod</u>		State <u>AB</u>		ZIP <u>T0L 0Z0</u> Country <u>Canada</u>	
NAME OF SECOND INVENTOR:		<input type="checkbox"/> A petition has been filed for this unsigned inventor			
Given Name (first and middle (if any)) <u>Nowal</u>		Family Name or Surname <u>Pierson</u>			
Inventor's Signature <u>[Signature]</u>		Date <u>June 27, 01</u>			
Residence: City <u>Vauxhall</u>		State <u>AB</u>		Country <u>Canada</u> Citizenship <u>Canadian</u>	
Mailing Address <u>P.O. Box 901</u>					
City <u>Vauxhall</u>		State <u>AB</u>		ZIP <u>TOK 2K0</u> Country <u>Canada</u>	
<input type="checkbox"/> Additional inventors are being named on the _____ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.					